

CLAIMS

1. Switching unit for switching a connection between a mains and a load, comprising:

5 a mains port for electrically connecting the switching unit to the mains,

a load port for electrically connecting the switching unit to the load,

10 a switching element for producing a substantially conductive electrical connection between the mains port and the load port in its closed state and substantially breaking the said electrical connection in its open state, and

current measuring means for measuring a consumption current consumed by the load, characterized in that the switching unit 15 comprises control means which are connected to the switching element, the control means comprising:

(a) means for at least temporarily bringing the switching element into its closed state;

20 (b) means for measuring a consumption current consumed by the load in the at least temporarily closed state of the switching element;

(c) means for checking the measurement on the basis of a criterion;

25 (d) means for bringing or holding the switching element into or in the open state if the measurement does not satisfy the criterion; and

(e) means for bringing or holding the switching element into or in the closed state if the measurement does satisfy the criterion.

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2. Switching unit according to claim 1, characterized in that the means mentioned under (c) comprise means for comparing the measured value of the consumption current with a threshold value, and

35 the means mentioned under (e) comprise means for closing the switching element or holding it in the closed state if the measured value of the consumption current is greater than or equal to the threshold value.

3. Switching unit according to claim 1, characterized in that the means mentioned under (c) comprise means for comparing the measured value of the consumption current with a threshold value, and

5 the means mentioned under (d) comprise means for bringing the switching element into the open state if the measured value of the consumption current is lower than the threshold value.

10 4. Switching unit according to claim 2 or 3, characterized in that the threshold value comprises a value for a no-load consumption current.

15 5. Switching unit according to claim 4, characterized in that the control means also comprise:

means for using the current measuring means to measure a consumption current for a load which has been brought into a no-load state, and means for storing the measured value of the consumption current as a no-load consumption current in a memory which is accessible to the switching unit.

20 6. Switching unit according to claim 5, characterized in that the control means comprise means for adding a margin value to the value for the no-load consumption current.

25 7. Switching unit according to one of claims 1-6, characterized in that the switching unit comprises voltage measuring means for measuring a mains voltage applied to the mains port, in that the switching element comprises a self extinguishing semiconductor switch, and in that the control means 30 comprise control pulse generation means for generating a control pulse for the self extinguishing semiconductor switch as a function of an instantaneous value of the mains voltage measured by the voltage measuring means.

35 8. Switching unit according to claim 7, characterized in that the control pulse generation means are also designed to generate a repeating pulse train, a repetition frequency of which corresponds to double a repetition frequency of the mains

voltage, for the purpose of holding the self extinguishing semiconductor switch in the closed state.

9. Switching unit according to claim 8, characterized in that
5 the control pulse generation means are also designed to shorten a
pulse duration of the control pulses after the end of a turn-on
time starting from the switching element reaching the closed
state.

10 10. Switching unit according to one of claims 7-9,
characterized in that the control pulse generation means are
designed to generate a control pulse in the open state of the
switching element just before a zero crossing of the mains
voltage, for the purpose of bringing the switching element into a
15 closed state during a measurement time.

11. Switching unit according to one of the preceding claims,
characterized in that the control means comprise a first and a
20 second supply voltage terminal for creating a supply voltage
between these terminals at the control means, the first supply
voltage terminal being connected to a terminal of the switching
element which is connected to the mains port and the second
supply voltage terminal being connected to a terminal of the
switching element which is connected to the load port.

25 12. Switching unit according to claim 11, characterized in that
the switching element comprises a voltage drop element for
causing a voltage drop across the switching element in operation
when the switching element is in the closed state.

30 13. Switching unit according to one of the preceding claims,
characterized in that the switching unit comprises a male plug
connector unit for electrically connecting the mains port to a
mains wall socket unit, and a female plug connector for
35 electrically connecting the load port to a male plug connector
which is connected to the load.

14. Switching unit according to one of the preceding claims, characterized in that the switching unit is accommodated in the load.

5 15. Switching unit according to one of the preceding claims, characterized in that the switching unit comprises a communications port for transmitting data from or to the control means.

10 16. Switching unit according to claim 15, characterized in that the communications port comprises a wireless connection.

17. Switching unit according to claim 15 or 16, characterized in that the communications port comprises a terminal for 15 connecting the switching unit to a data-processing system.

18. Electrical appliance comprising a switching unit according to one of claims 1-17.

20 19. Method for switching a connection between a load and a mains, the load being connected to the mains via a switching element for the purpose of producing an electrical connection between the load and the mains in a closed state of the switching element and substantially breaking the said electrical connection 25 in an open state of the switching element, characterized by the steps of:

(a) at least temporarily bringing the switching element into the closed state;

(b) measuring a consumption current consumed by the load in the

30 at least temporarily closed state of the switching element;

(c) checking the measurement against a criterion;

(d) bringing or holding the switching element into or in the open state if the measurement does not satisfy the criterion; and

(e) bringing or holding the switching element into or in the 35 closed state if the measurement does satisfy the criterion.

20. Method according to claim 19, characterized in that, if the switching element is in the open state, step (c) comprises the step of

comparing the measured value of the consumption current with a threshold value; and

step (e) comprises the step of closing the switching element or holding the switching element in the closed state if the measured value of the consumption current is greater than or equal to the threshold value.

5 21. Method according to claim 20, characterized by repeating steps (a), (b), (c) and (d) if the measured value of the 10 consumption current is lower than the threshold value.

22. Method according to claim 19, characterized in that, if the switching element is in the closed state, step (c) comprises the step of

15 comparing the measured value of the consumption current with a threshold value; and
step (d) comprises the step of bringing the switching element into the open state if the measured value of the consumption current is lower than the 20 threshold value.

23. Method according to claim 22, characterized by repeating steps (b), (c) and (e) if the measured value of the consumption current is greater than or equal to the threshold value for one 25 or more of a predetermined number of repetitions, the switching element being moved into the open state if the measured value of the consumption current is lower than the threshold value for the predetermined number of repetitions.

30 24. Method according to one of claims 20-23, characterized in that the threshold value comprises a value of a no-load consumption current.

35 25. Method according to claim 24, characterized in that the method comprises the initial steps of:

- (f) bringing the load into a no-load state;
- (g) bringing the switching element into the closed state;
- (h) measuring the consumption current;

(i) storing the measured value of the consumption current as a no-load consumption current in a memory which is accessible to the switching unit.

5 26. Method according to claim 25, characterized in that step (i) also comprises the step of:
adding a margin value to the value of the no-load consumption current.

10 27. Method according to claim 24, characterized in that the method also comprises the steps of:
comparing the measured value of the consumption current with the value for the no-load consumption current;
storing the measured value of the consumption current as a no-
15 load consumption current in a memory which is accessible to the switching unit if the measured value of the consumption current is lower than the no-load consumption current.

20 28. Method according to one of claims 19-27, characterized in that the method also comprises the steps of:
comparing the measured value of the consumption current with a maximum value; and
opening the switching element if the measured value of the consumption current is greater than the maximum value.

25 29. Method according to one of claims 20-29, characterized in that step (b) takes place with a repetition period which is an integer multiple of a repetition period of the mains voltage.

30 30. Method according to one of claims 20-30, characterized in that the steps (a) and (b) comprise the steps of:
repeatedly or continuously measuring an instantaneous value for the mains voltage;
closing the switching element between two successive zero
35 crossings of the mains voltage;
measuring the consumption current; and
opening the switching element.

31. Use of the switching unit according to one of claims 1-17 for powering a battery charger.
32. Use of the switching unit according to one of claims 1-17 5 for providing a supply voltage to and/or interrupting a supply voltage for a load at at least one predetermined time.
33. Use of the switching unit according to one of claims 1-17 10 for providing a supply voltage to and/or interrupting a supply voltage for a load in response to an external signal.